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Please carefully read the instruction manual before using the tester, and pay special attention to “Warning” content. Please follow instructions under “Warning”.

1. Please be very careful when test voltage is higher than AC 30 V, and do keep in mind that your finger shall not exceed the hand-shielding part of the test probe.
2. Do not measure voltage which is higher than the allowed input limit.
3. Before use, please check the meter and test probe; do not carry out testing in case the test probe is naked, tester housing is damaged, or there is no LCD display, etc..
4. It meets requirements of safety standards only when the meter is used together with the supplied test probes. In case the test probe is damaged and needs replacement, it is required to replace it with a test probe of the same model

and identical electrical specifications.

5. Please never carry out any voltage measurement whenever the test probe is inserted in any current outlet.
6. Please do not expose the meter to strong light, high temperature, or dampness.

Before use, please carefully read this instruction manual. Especially safety contents!

Safety Instructions

The digital power meter is designed and manufactured in accordance with international standard, IEC61010-1, and international safety specification, IEC1010-2-032, and the meter strictly follows the safety standard of double-insulation AC 600 V CAT III.

Safety Sign

	Important safety signs; please refer to instruction manual
	High voltage hazard
	Earthing
	Double insulation (Category-II safety equipment)
	Battery low Indicator

General Description

The digital power meter is a hand-held intelligent harmonic power tester, with both functions of digital current testing and power testing. The tester is comprised of three channels including voltage, current, and power as well as a micro single chip system, and it is equipped with a powerful software for measurement and data processing functions; it can

measure, calculate, and display voltage, current, active power, power factor, apparent power, passive power, frequency, harmonic parameters, with stable performance and operation convenience. The meter is especially suitable for the measurement and examination of on-site power equipment and power-supplying circuits; with hand-held clamp structure, small volume, and light weight, it can be easily carried by the user, which makes it easy and fast for doing measurement. For measurement of sing-phase power, The meter is your ideal choice.

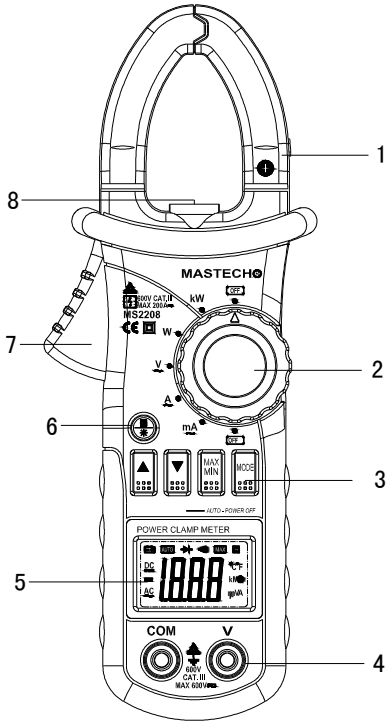
Features

1. The meter can be used for testing power, voltage, current, peak value, phase, frequency, power factor, phase angle, and reaction factor, etc. of single-/three-phase circuit; automatic phase sequence testing is possible for 3-phase measurement.

2. True effective value measurement: accurate measurement is possible even with serious distortion in current waveform.
3. Low-consumption high-speed single-chip microprocessor is employed and sophisticated algorithm is applied, as a result, results can be obtained rapidly and precisely, and up to 20 harmonics and distortion value thereof can be measured.

Hand-held, clamp-type structure, with light weight, convenient for carry-on.

Appearance


1
8
7
2
6
3
5
4
MASTECH
MS2208
kW
W
V
A
mA
OFF
MAX
MIN
MODE
AUTO • POWER OFF
POWER CLAMP METER
COM
V
600V
CAT. III
MAX 600Vrms

1. Current clamp size：Φ26mm
2. Function-switching knob :Rotation knob for selecting different measuring function
3. Function-selection button: Button for operating the measuring functions
4. Input terminal

Terminal	Function
V	Input terminal for measuring the first phase; use yellow test probe for connection
COM	Input terminal for measuring the 2nd phase; use black test probe for connection. Common terminal: ground input terminal (earthing) for all measuring functions; use black test probe for connection.

5. LCD display :4-digit digital display; 7-section

LCD for displaying measurement operation function, test result, and unit sign.

6. H/✳ 键：HOLD button :DATA HOLD button; press down HOLD button, and the last reading will be held and displayed on the display, and “HOLD” symbol will be shown; press HOLD button again, and the meter will switch back to normal measurement mode.
7. Trigger :Press down the trigger, and the clamp will open; release it, and the clamp will close.
8. LED Lamp

   In power and current mode ,press ✳button open or close Lamp

Knob Switch Operations

The function-switching knob is used for powering-on and for switching to any measurement function in the following table.

Knob position description

Sign	Knob position	Functions
OFF	Powering-off position	For powering-off
KW	Active power position	For measuring active power, etc.
W	power position	For measuring active power, etc.
V～	AC-voltage harmonics test position	For measuring AC-voltage harmonics, etc.
A～	AC-current harmonics test position	For measuring AC-current harmonics, etc.
mA～	AC-voltage harmonics test position	For measuring AC-voltage harmonics, etc.

Note:

When the meter is automatically powered off, be sure to switch the knob to "OFF" position; turn on the meter after 5 seconds.

Button Switch Operations

Button descriptions

SN	Function-selection button	
1	**MODE**	Test-mode switching button
2	▲	Reverse-search button
3	▼	Forward-search button
4	**MIN/MAX**	MAX/MIN Value
5	**H/** 	HOLD/LIGHT

The following functions can be realized through button operations:

1. MODE:

Under KW/W test mode, you can press **MODE** button to switch the display of active power and passive power; under A/V~ test mode, you can switch

the display among total harmonic distortion rate F, r, and harmonic percentage.

2. ▲:

press ▲ button to change view MAX value,MIN value,measuring time; During testing harmonics, you can change the times of harmonics.

press ▲ button to search backward thestored data and show it on LCD. With every press of the button, the searching cursor will move one step backward to the previous data.

3. ▼ :

press ▼ button to change view MAX value,MIN value,measuring time; During testing harmonics, you can change the times of harmonics.

press ▼ button to search foreward thestored data and show it on LCD. With every press of the button, the searching cursor will move one step foreward to the previous data.

4. **MAX/MIN:**

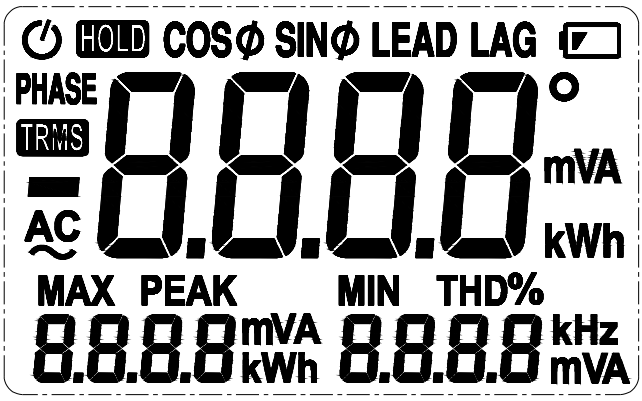
In test mode ,press MAX/MIN button to view

the max /min Power,current,voltage.

5. **HOLD/** ☀ **:**

After measurement, press this button to hold this data on LCD; after powering-off, data will display Press this button longer than 1S,Open or close the back light.

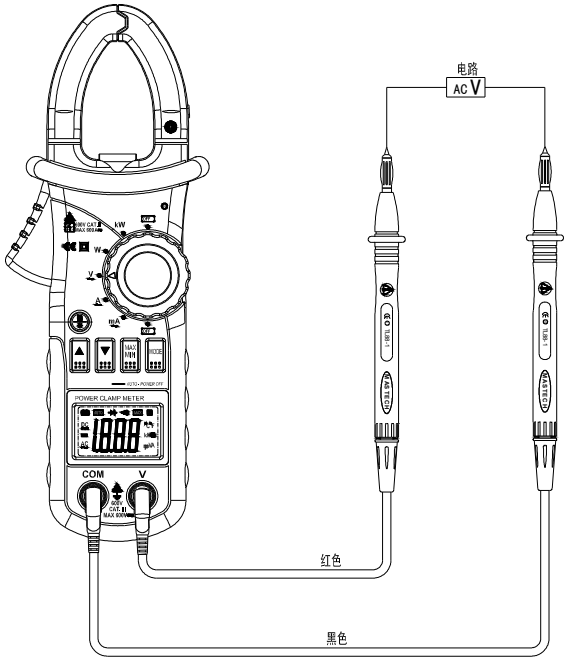
LCD DISPLAY



LCD symbol	Description	LCD symbol	Description
	AutoPower Off	HOLD	Hold
LAG	Phase angle lag	LEAD	Phase angle lead
	Battery power indication	o	Phase angle (degree)
SINΦ	Phase angle (degree)	COSΦ	Power factor
	AC symbol	PEAK	Peak value
Hz	Frequency		Negative symbol
MIN	Minimum value	MAX	Maximum value
USED	Used	READ	read
W	watt	A	current
VAr	Passive power	**VA**	Apparent power
PHASE	phase	**TRMS**	TRMS
%	Harmonic percentage	V	Voltage

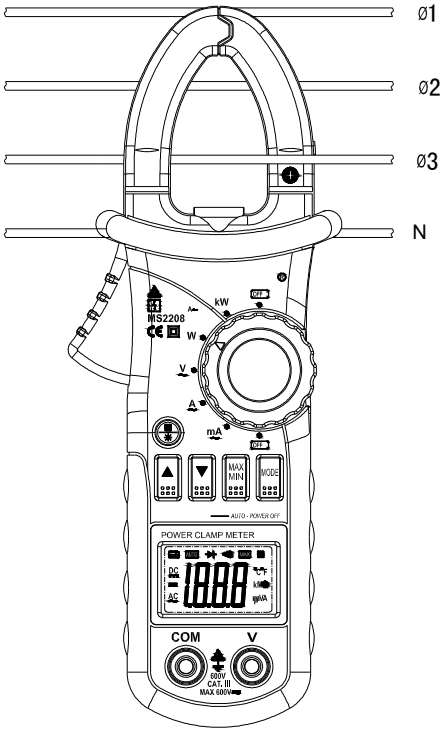
LCD symbol	Description	LCD symbol	Description
%THD	Total harmonics distortion ratio		
H01F	Total harmonics distortion ratio F (relative to base wave)		
H01r	Total harmonics distortion ratio r (relative to real effective value)		

Instruction Manual
AC voltage (V) measurement



1. According to the connection mode as above Table , switch the function switching knob to V~, select corresponding sockets from V,COM terminal, and insert the test wire.
2. Connect the two test probes V1, COMto the power source or load to be tested. The meter will automatically test and display the result, and the present harmonics percentage will be shown on the following line.
3. Under voltage test mode, press MAX/MIN button to view Max or Min value
4. Press MODE button to show harmonics percentage on LCD, and the total harmonic distortion ratio F and R will be cyclically displayed. Press▲/▼ button to display value of each measurement of the harmonic.

AC CURRENT measurement



1. Switch the function knob to A~ position;
2. Pull the trigger to open the clamp, and then clip a wire which is to be tested; the measured current value will be automatically shown on LCD
3. Press MODE button to show harmonics percentage on LCD, and the total harmonic distortion ratio F and r will be cyclically displayed.
4. Press ▲/▼ button to display value of each measurement of the harmonic.
5. press MAX/MIN button to view Max or Min value

Note:

1. You can select 50/60-Hz FIXED/AUTO frequency test (AUTO). When input waveform fluctuates, displayed harmonic values can be kept stable if 50/60-Hz FIXED mode is selected.
2. Under AUTO frequency test mode, FFT

calculation is performed only when base-wave frequency is between 45 and 65 Hz; harmonic analysis is not performed when base-wave frequency exceeds this range.

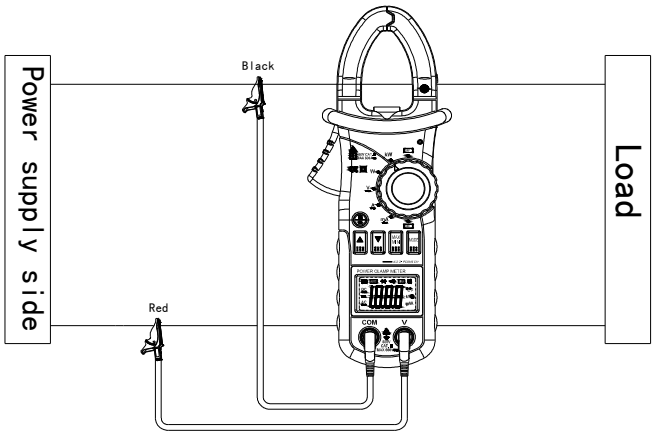
Test of single-phase circuit

1. Clip the clamp on the test wire of the power supply or load. If the user needs to measure a certain phase of the 3-phase circuit, then the clamp should clip on the wire of the same phase.
2. switch the function switching knob to KW/Wposition, select corresponding input sockets from V1 or COM terminal and insert the test wire
3. After it is correctly connected, you can measure single-phase power (active power, power factor, apparent power, passive power, voltage, current, phase angle, peak value of voltage and current, and frequency):
4. The meter will carry out automatic measurement and display active power, and voltage/current

value of the load being tested will be displayed on the bottom line of LCD; press down MODE button, Var value of passive power will be displayed on LCD; press WATT button to display apparent power and power factor (cos Φ); negative power factor signifies that the load being tested is a load with capacitor characteristics.

5. The maximum measurement range of active power kW is 120 kW; if this range is exceeded, “OL” symbol will be displayed beyond this range. If voltage being tested is greater than 600 V, or current being tested greater than 200 A, “OL” symbol will be displayed on LCD.
6. The min. input voltage is 10 V and the min. input current is 10mA; if active power value is smaller than this limit, “0.00 kW” will be displayed in stead of active power value.
7. Press Max/Min value to view Max/Min Value

8. Passive power is a value not directly measured; equation for kVAr is $kVAr^2=kVA^2-kW^2$; its value is calculated by software based on the measured voltage, current and active power, and displayed on LCD.



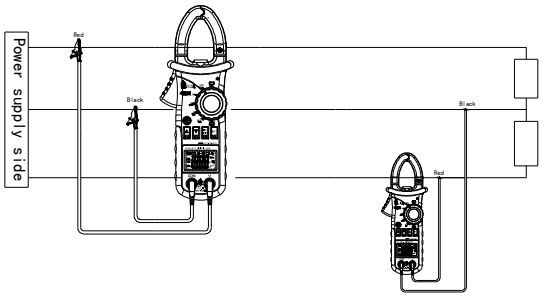
cosΦ, sinΦ, and phase angle measurement

1. Switch the function-switch knob to KW/W position, and the test wire is inserted to V1/COM input terminals.
2. The meter will automatically measure and display power factor, voltage value and current value.
3. Press **MODE** button to display phase angle, power factor (cos Φ), and sinΦ; negative power factor signifies that the load being tested is a load with capacitor characteristics.
4. Press MAX/MIN Button to view Max value,Min value,measuring time.

Single-phase three-line circuit

the process for measuring power and power fact or for single-phase three-line circuit is the same as that for single-phase two-line circuit, where th e black clip is connected to the middle wire, and

the red clip and clamp-type sensor are simultan eously connected to all test wires.



Input Voltage and Current

During power measurement, if input voltage is over 600 V (RMS) or current over 200 A (RMS), “OL” symbol will be displayed and bar symbol shown in full scale.

Backlight

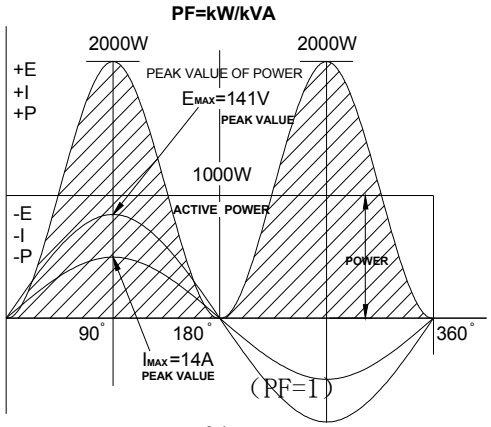
Press ☀ button longer than 1s, the backlight will be lit up, and it will then be automatically turned off after about 20 seconds.

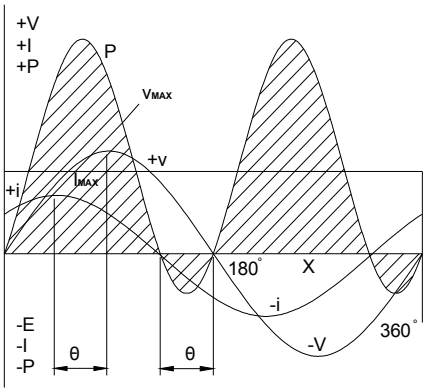
Auto Power Off

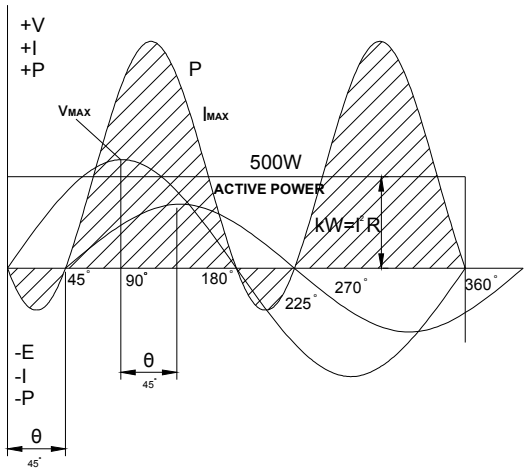
1. If there is no function change or button press fo 10 minutes ,the meter will automatically turn power off , When the meter is automatically powered off, be sure to switch the knob to “OFF” position; turn on the meter after 5 seconds.
2. Holding the button ☀ down while turning the meter on,Disables automatic power -off

Power curve diagram

(Active power=apparent power × PF)




+V
+I
+P
P
VMAX
+V
+i
IMAX
180°
X
-i
-E
-I
-P
θ
θ
-V
360°


+V
+I
+P
P
VMAX
IMAX
500W
ACTIVE POWER
kW=I²R
45°
90°
180°
225°
270°
360°
-E
-I
-P
θ
45°
θ
45°

Battery-low Indication

If battery voltage is low, “  ” symbol will be displayed on the upper right corner of LCD. Then, it is needed to replace new batteries.

Battery Replace

Warning

1. Before opening the back lid to replace batteries, please make sure the meter is turned off and no test probe is connected to any test wire so as to avoid electrical shock; before using the meter, please make sure the back lid is tightly closed. Only batteries of identical model or electrical specification can be used.
2.  ” symbol is shown on LCD, it signifies that battery voltage with load is lower than the minimum voltage for ensuring measurement error limits, and the meter will prompt you to change new batteries. Please follow the steps below to replace batteries:

3. Disconnect test probes from test circuit, and rotate function-switching knob to “OFF”, and then take off test probes from the input sockets.
4. Open battery cove, Take out old batteries, and replace them with 3new 1.5 V batteries. New batteries shall not be used together with old ones. Properly close the battery cover.

General specification

Complies with IEC/EN 61010-1 1000V CAT II ,600 V CAT III

1. Max. common-mode voltage: 600V AC RMS
2. Mode of display: LCD display; Max. reading: 6000
3. Range selection: Fully automatic range selection
4. Frequency detection: automatic (when harmonic is serious, it is better to use manual settings for testing frequency so as to assure the reading stability)

5. Over-range display: “OL”
6. Data holding: “HOLD” is shown on LCD
7. Power supply: 3 batteries of 1.5 V, AAA
8. Power consumption: 250 mW
9. Storage temperature: - 20 °C ~ 70 °C
10. Operating temperature: 0 °C ~ 40 °C
11. Temperature Coefficient:0.05 × (specified accuracy)per°C
12. Electromagnetic Compatibility: In an RF field of 3V/M,accuracy=specified accuracy , Otherwise accuracy is unspecifieced.
13. Operating Altitude: 2000m CAT Ⅲ 600V；3000m CAT Ⅱ600V
14. Store Altitude: 12000m
15. Dimensions: 208mm×78mm×35mm
16. Weight: about 350 g (with battery)

Technical specification

Accuracy: ±(% read + graduation #) ambient temperature: 18°C ~ 28°C, Humidity 80%, frequency for voltage, current: 45 Hz ~ 65 Hz

AC Voltage RMS

Range	Accuracy	Resolution	Input impedance
10V-600V	± (1.0%+5)	0.1V	1 MΩ // 10 pF

Max. allowed overload voltage: 750 V (RMS)

AC Current RMS

Range	Accuracy	Resolution
10mA-3999mA	±(2%+5)	0.01mA
4A-200A	±(2%+5)	0.01A

Max. allowed overload current: 200 A

Single-phase active power （W）

Range	Accuracy	Resolution
0.01W-120KW	±(3%+5)	0.01W

Min. test current: 10mA; Min. test voltage: 10V

Power factor

Range	Accuracy	Resolution
0.3～1 Capacitive	±(0.02+2)	0.001
0.3～1 Inductive	±(0.02+2)	0.001

Min. test current: 10mA; Min. test voltage: 10V

Passive power $(VAr)^2=(VA)^2+W^2$

Range	Accuracy	Resolution
0.01W-120KW	±(3%+5)	0.01VAr

Min. test current: 10mA; Min. test voltage: 10V

Passive power Var is calculated according to the measured V, A, and kW value。

Frequency (Hz)

Range	Accuracy	Resolution
30Hz～1kHz	0.5%+1	0.1Hz

Min. test current: 10mA; Min. test voltage: 10V

Harmonic test

Harmonic number	Precision of harmonic voltage
1	±(3.0%+10)
2-6	±(3.5%+10)
7-8	±(4.5%+10)
9-10	±(5.0%+10)
11-15	±(7%+10)
16-20	±(10%+10)

Min. test current: 20mA; Min. test voltage: 20V

Accessories

Item	Quantity
Instruction Manual	×1
Battery	1.5V AA A Battery×3
Test Leads	×1
Test clip	×2（Red,Black）
Package box	×1

Quality Assurance

Thank you for using the product of our company; this product has a warranty period of one year starting from purchasing date.

This product has passed the strict quality test of our company. Our company will exert our efforts to do after-sales service for you in accordance with the

Warranty instructions.

In case there is any problem occurred during warranty period, which is resulted from product quality problem, please fill in the warranty card and mail it in together with the product, and the service department of our company will repair it or replace it free of charge, while the user himself/herself shall not take the meter apart.

When warranty period is over, the repairing will be charged.

Free service does not apply to the following cases:

Problems and damages due to improper use or use under environment which is not stipulated for this product, including overloading.

Problems and damages due to unauthorized dismantling or refitting and misuse.

Problems and damages due to user reasons.

Problems and damages due to natural disasters.